



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/087,493	02/28/2002	Michael C. Rushford	IL-10738	3025

7590 09/16/2004

James S. Tak
Assistant Laboratory Counsel
Lawrence Livermore National Laboratory
P.O. Box 808, L-703
Livermore, CA 94551

EXAMINER

CULBERT, ROBERTS P

ART UNIT	PAPER NUMBER
----------	--------------

1763

DATE MAILED: 09/16/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/087,493

Applicant(s)

RUSHFORD, MICHAEL C.

Examiner

Roberts Culbert

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 August 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-65 is/are pending in the application.
- 4a) Of the above claim(s) 7,21,23, 30 and 34-65 is/are withdrawn from consideration.
- 5) ☒ Claim(s) 18-20,22,24 and 25 is/are allowed.
- 6) ☒ Claim(s) 1-4,8-10,15-17,26,27 and 31-33 is/are rejected.
- 7) ☒ Claim(s) 5,6,11-14,28 and 29 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Response to Arguments

Applicant's arguments filed 8/19/04 have been fully considered but they are not persuasive.

Applicant has argued,

"Miracky does not in fact teach or suggest imagewise etching in a parallel process, using instead a serial etching process. Support for a serial etching process is found in column 5, lines 56-61 of Miracky as follows:

"By displacing the laser beam or the workpiece, the chemical etching occurs on the workpiece selective along the path of displacement of the laser beam relative to the workpiece. Thus, an etching pattern is defined by the size of the beam and the path of displacement."

And displacement of the laser beam is performed by a translation stage, described in column 8, lines 42-45 as follows:

"A computer-controlled X-Y translation stage was used to translate and position the sampled relative to the fixed laser beam."

It is clear from these passages in Miracky that etch patterns are created on a substrate surface corresponding to and determined by the displacement path of the laser beam (a serial activity), which is antithetical to the parallel or "imagewise" etching process of the present invention."

The argument is not persuasive to overcome the rejection of the previous office action because although patterns are formed corresponding to the displacement path of the laser beam, as argued by applicant, the pattern etched is also determined by the size of the beam as stated in the passage cited by applicant. Thus, the pattern formed by the size of the focus region of the laser forms a pattern in a parallel process where etching takes place concurrently or simultaneously at a plurality of local target regions of the substrate surface as broadly claimed by applicant.

Art Unit: 1763

Election/Restrictions

Applicant's election with traverse of Claims 1-6, 8-20, 22-29, and 31-33 in the response filed 4/23/04 is acknowledged. The traversal is on the ground(s) that apparatus cannot also be used to practice another materially different process such as a process that uses an etch solution having an etch rate that does not increase with temperature.

Applicant has argued *"the type of etchant solution, i.e. one "having an etch rate which increases with temperature", is a substantive limitation of the means plus function language of claim 34 enabling the imagewise etching functionality of the substrate in a parallel process. Therefore, and contrary to the Examiner's suggestion, the apparatus of claim 34 cannot be used to practice his suggested alternative process without destroying the functionality and utility of the invention because the ability to differentially control etch rates in the local regions would be lost."*

The argument is not persuasive as there is no evidence nor convincing line of reasoning to demonstrate that the apparatus could not be used with an etch solution having an etch rate that decreases with increasing temperature. Applicant has not explained why the functionality or utility would be lost, since such a solution would still have an etch rate controlled by temperature.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4, 8-10, 15-17, 26, 27, and 31-33, are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 4,904,340 to Miracky et al.

Referring to the figures and disclosure, Miracky teaches a method of figuring a substrate (58) surface comprising the steps of: contacting the substrate surface with an etchant solution (62), wherein an etch rate of

Art Unit: 1763

the etchant solution increases with temperature (Fig 7); and generating a local thermal gradient in each of a plurality of selected local regions of a boundary layer of the etchant solution to imagewise etch the substrate surface in a parallel process. (Note that the limitation of generating a local thermal gradient in each of a plurality of selected local regions of a boundary layer of the etchant solution is inherent in the method of Miracky since Miracky heats a plurality of regions on the substrate, which are in direct contact with the etchant solution. It is clear from Fig 5, for example that the substrate is imagewise etched in a parallel process as broadly defined by applicant.

Miracky further teaches that the step of generating a local thermal gradient in each selected local region comprises locally heating each selected local region, whereby the selected local regions etch the substrate surface at higher etch rates than non-selected local regions and independently controlling the local heating of each selected local region to produce region-specific heating gradients in the boundary layer and thereby imagewise etch the substrate surface at region-specific etch rates as recited in claims 2 and 3.

Regarding Claims 4, 15-17, 26 and 27, Miracky teaches that the local thermal gradient is generated by projecting electromagnetic radiation (laser) towards selected local regions of the boundary layer of the etchant solution and on a heatable material (substrate) in conductive contact with the boundary layer. (Col 1, Lines 13-20) Miracky further teaches that a computer processor is provided to independently control the local heating of each selected region. (Col 4, Lines 33-37)

Regarding Claims 8-10 and 31-33, Miracky teaches that the etchant solution is macro-cooled by fluid convection to a null etch rate whereby no etching takes place prior to the heating of the selected local regions. See Fig 2 and 3 and (Col. 4, Lines 43-68).

Allowable Subject Matter

Claims 18-20 and 22-25 allowed.

The following is an examiner's statement of reasons for allowance: the prior art of record fails to teach or render obvious a method of figuring a substrate surface comprising the steps of: contacting the substrate surface with an etchant solution, wherein an etch rate of the etchant solution increases with

Art Unit: 1763

temperature; activating a plurality of selected heaters corresponding to a plurality of selected local regions of a boundary layer of the etchant solution, and chosen from an indexed array of heaters each for locally heating a corresponding local region of the boundary layer upon selective activation thereof; and independently controlling by a computer processor the activation of each selected heaters to produce region-specific heating gradients in the selected local regions of the boundary layer and thereby imagewise etch the substrate surface at region-specific etch rates in a parallel process.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Claims 11-14, are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach or render obvious a method of figuring a substrate surface comprising the steps of: contacting the substrate surface with an etchant solution, wherein an etch rate of the etchant solution increases with temperature; and generating a local thermal gradient in each of a plurality of selected local regions of a boundary layer of the etchant solution to imagewise etch the substrate surface in a parallel process, wherein the step of generating a local thermal gradient in each selected local region comprises locally heating each selected local region, whereby the selected local regions etch the substrate surface at higher etch rates than non- selected local regions wherein the step of locally heating each selected local region comprises activating a plurality of selected heaters corresponding to the selected local regions and chosen from an indexed array of heaters each locally heating a corresponding local region of the boundary layer upon selective activation thereof.

Art Unit: 1763

Claims 5, 6, 28 and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art of record fails to teach or render obvious a method of figuring a substrate surface comprising the steps of: contacting the substrate surface with an etchant solution, wherein an etch rate of the etchant solution increases with temperature; and generating a local thermal gradient in each of a plurality of selected local regions of a boundary layer of the etchant solution to imagewise etch the substrate surface in a parallel process, wherein the step of generating a local thermal gradient in each selected local region comprises locally heating each selected local region, whereby the selected local regions etch the substrate surface at higher etch rates than non- selected local regions wherein a computer processor is provided to independently control the local heating of each selected local region and further comprising the step of interferometrically monitoring the substrate surface to deterministically control the computer processor and the region-specific etch rates.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

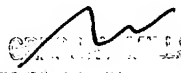
Art Unit: 1763

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Roberts Culbert whose telephone number is (571) 272-1433. The examiner can normally be reached on Monday-Friday (7:30-4:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gregory Mills can be reached on (571) 272-1439. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

R. Culbert



GREGORY MILLS
SUPERVISOR, EXAMINER
TECHNOLOGY CENTER 1700